

Attorney Docket No. 83438  
Customer No. 23523

A WINGLET FOR THE TRAILING END OF TOWED FLEXIBLE UNDERWATER LINES

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN that (1) NEIL J. DUBOIS, and (2) BRUCE E. SANDMAN, citizens of the United States of America, employees of the United States Government, and residents of (1) Cranston, County of Kent, State of Rhode Island, and (2) Tiverton, County of Newport, State of Rhode Island, have invented certain new and useful improvements entitled as set forth above, of which the following is a specification.

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5 STATEMENT OF GOVERNMENT INTEREST

6 The invention described herein may be manufactured and used  
7 by or for the Government of the United States of America for  
8 Governmental purposes without the payment of any royalties  
9 thereon or therefor.

10

11 BACKGROUND OF THE INVENTION

12 1. Field of the Invention

13 The invention relates to the movement of towed underwater  
14 lines and is directed more particularly to a winglet for mounting  
15 on a trailing end of such lines and operating to improve  
16 stability of the line during towing.

17 2. Description of the Prior Art

18 Underwater vehicles, such as submarines and unmanned  
19 underwater vehicles (UUV), may be provided with a somewhat  
20 flexible line which can be paid out of the submerged vehicle and  
21 towed through the water by the vehicle. Typically, the line  
22 extends from a bow portion of the vehicle. The line is often  
23 provided with a multiplicity of acoustic sensor elements. While  
24 the line is somewhat flexible, it also exhibits some rigidity,  
25 such that when the line is being towed through the water, the

1 line tends to bend rearwardly and well outwardly from the  
2 vehicle.

3        The vehicle is provided with a stabilizing tether which is  
4        paid out from the stern area of the vehicle and at its distal end  
5        is fastened to the towed line proximate the distal end thereof.  
6        The stabilizing tether is reeled in to bring the trailing end of  
7        the towed line in nearer the vehicle. The tether is under  
8        tension and provides some measure of stability to the towed line.

9       Nonetheless, the trailing end of the towed line is subject  
10      to substantial vibration which is unwanted inasmuch as the  
11      acoustic, or other measuring devices or sensors carried in the  
12      towed line, may be highly position dependent. That is, to gain  
13      the most from the measuring devices or sensors, it is required  
14      that the precise positions of the devices be known on a  
15      continuing basis. There is thus a need to diminish and limit the  
16      vibrational movement of the trailing end of the towed line.

## SUMMARY OF THE INVENTION

19 An object of the invention is, therefore, to steady and  
20 stabilize the towed line so as to improve pin-pointing the  
21 positions of instruments carried in the line.

22 With the above and other objects in view, a feature of the  
23 invention is the provision of a winglet for mounting on a  
24 trailing end of a flexible line to be towed by an underwater  
25 vehicle. The winglet comprises an internal collar member for

1 connection to an inside surface of the line at the trailing end  
2 thereof, and an outer collar member for connection to an outside  
3 surface of the line outboard of the internal collar. Connection  
4 means are provided for fixing the internal and outer collar  
5 members to the line trailing end, and a plurality of fins are  
6 mounted on an outside surface of the outer collar member and  
7 extend outwardly from the outer collar member.

8 The above and other features of the invention, including  
9 various novel details of construction and combinations of parts,  
10 will now be more particularly described with reference to the  
11 accompanying drawings and pointed out in the claims. It will be  
12 understood that the particular device embodying the invention is  
13 shown by way of illustration only and not as a limitation of the  
14 invention. The principles and features of this invention may be  
15 employed in various and numerous embodiments without departing  
16 from the scope of the invention.

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#### 18 BRIEF DESCRIPTION OF THE DRAWINGS

19 Reference is made to the accompanying drawings in which are  
20 shown illustrative embodiments of the invention, from which its  
21 novel features and advantages will be apparent, wherein  
22 corresponding reference characters indicate corresponding parts  
23 throughout the several views of the drawings and wherein:

24 FIG. 1 is a diagrammatic representation of an underwater  
25 vehicle having a flexible line extending therefrom, with a

1      winglet in accordance with the present invention fixed on a  
2      trailing end of the line;

3            FIG. 2 is a sectional enlarged view of the winglet of FIG.  
4      1; and

5            FIG. 3 is a sectional view, similar to FIG. 2, but  
6      illustrative of an alternative embodiment.

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#### 8            DESCRIPTION OF THE PREFERRED EMBODIMENTS

9            Referring to FIG. 1, it will be seen that an underwater  
10     vehicle 10 is provided with a hollow line 12 extending from a bow  
11     area of the vehicle and in which are disposed a series of sensors  
12     or measuring devices 14, typically acoustic devices. A tether 16  
13     extends from the stern area of the vehicle 10 and is connected to  
14     a trailing end 18 of the line 12 to stabilize the end 18, as  
15     described hereinabove.

16           To further stabilize the line 12 and the devices 14, and in  
17     accordance with the invention, there is provided a winglet device  
18     20 for attachment to the trailing end 18 of the line 12.

19           Referring to FIG. 2, it will be seen that the winglet 20  
20     includes a cylindrically shaped internal collar member 22 for  
21     connection to an inside surface 24 of the line 12 proximate the  
22     trailing end 18 thereof. The winglet 20 further includes a  
23     cylindrically shaped outer collar member 26 for connection to an  
24     outside surface 28 of the line 12 outboard of the internal collar  
25     member 22.

1 Connection means 30, usually fasteners, such as bolts, are  
2 provided for fixing the internal and outer collar members 22, 26  
3 to the line trailing and 18, as shown in FIG. 2. Alternatively,  
4 the winglet 20 may be adhesively bound to the line 12, or,  
5 depending upon the material from which the winglet is made, may  
6 be molded integrally with the line 12.

7 A plurality of fins 32 are mounted on an outside surface 34  
8 of the outer collar member 26 and extend outwardly, or outboard,  
9 from the outer collar member 26.

10 While the winglet 20 may be molded of the same material as  
11 the line 12, it is presently preferred that the winglet be  
12 fabricated from a light-weight, corrosion-resistant metal, such  
13 as aluminum. Such a winglet, along with mechanical connection  
14 means 30, facilitate use of the winglet as an "add-on" to lines  
15 12 currently in use.

16 Referring to FIG. 3, it will be seen that an alternative  
17 embodiment of the outer collar member 26 includes a first  
18 component 36 having threads 38 at an after end thereof, and a  
19 second component 40 having threads 42 thereon engageable with the  
20 first component threads 38. The fins 32 are fixed to the second  
21 component 40, which may be threadedly attached to and removed  
22 from the first component 36 which, in turn, is fixed to the line  
23 12.

24 The embodiment of FIG. 3 enables the quick and easy  
25 replacement of fins, either because of damage or because of the

1 desirability of a particular fin configuration for a particular  
2 task.

3 There is thus provided a winglet which may be affixed to the  
4 trailing end of a line to be towed by an underwater vehicle to  
5 steady and stabilize the trailing end of the towed line, to  
6 improve positional accuracy of instruments carried in the line.

7 It will be understood that many additional changes in the  
8 details, materials, and arrangement of parts, which have been  
9 herein described and illustrated in order to explain the nature  
10 of the invention, may be made by those skilled in the art within  
11 the principles and scope of the invention as expressed in the  
12 appended claims.